Current ARC Performance Capabilities

July 14, 2016

ARC Laser IPT

Lawrence Livermore National Laboratory

LLNL-PRES-XXXXXX

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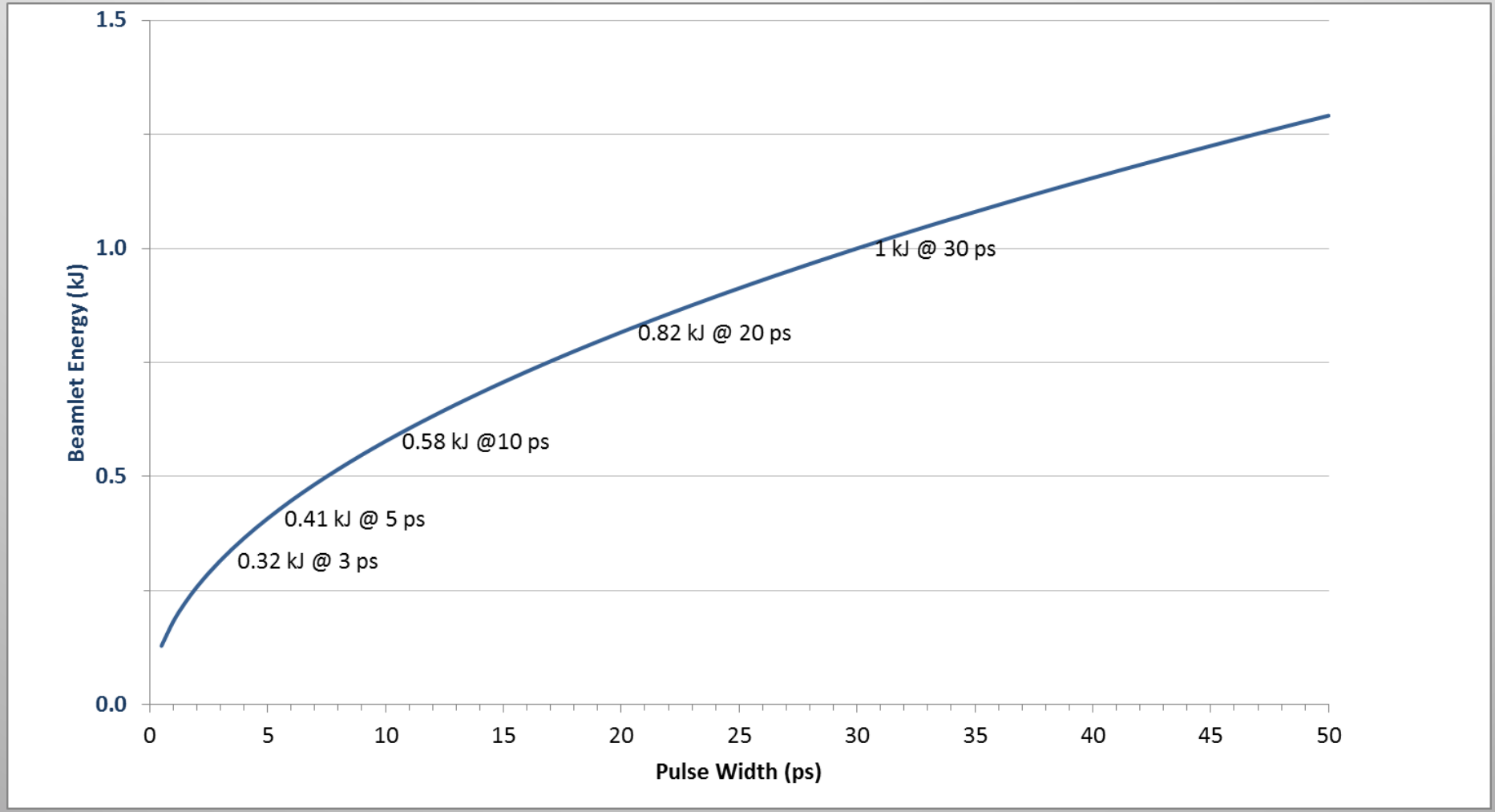
ARC current performance capabilities

ARC Beamlet	Current Capabilities			
Number	4			
Pulse duration	3 ps[1]	5 ps[1]	10 ps[1]	30 ps
Energy	0.3 kJ[1]	0.4 kJ[1]	0.6 kJ[1]	1 kJ
Focal spot (~ 30 ps, ~ 1 kJ)	10-30% of energy at ≥1e17 W/cm^2 ≥30-50% in 150 μm spot			
Alignment accuracy[2] rms (X_{ARC},Y_{ARC})	(42, 31) μm			
Pointing range from TCC (ARC)	(±50,±50,+10/-45) mm			
Beamlet-to-beamlet pointing	1.5 mm			
Pre-pulse contrast	80 dB (t< -1 ns), 60-70 dB (t≈ -1 ns), 70 dB (t< -200 ps)			
Timing Accuracy ARC to ARC	10 ps rms (any beamlet wrt any other beamlet)			
Timing Accuracy ARC to NIF	30 ps rms (any beamlet wrt NIF)			
Delay relative to NIF[3]	Up to 70 ns (any beamlet wrt NIF[4])			
Delay of B beamlet wrt A beamlet	Up to 30 ns (B after A)[4]			
Delay of B354 wrt B353	Up to 1.8 ns (B353 after B354)			

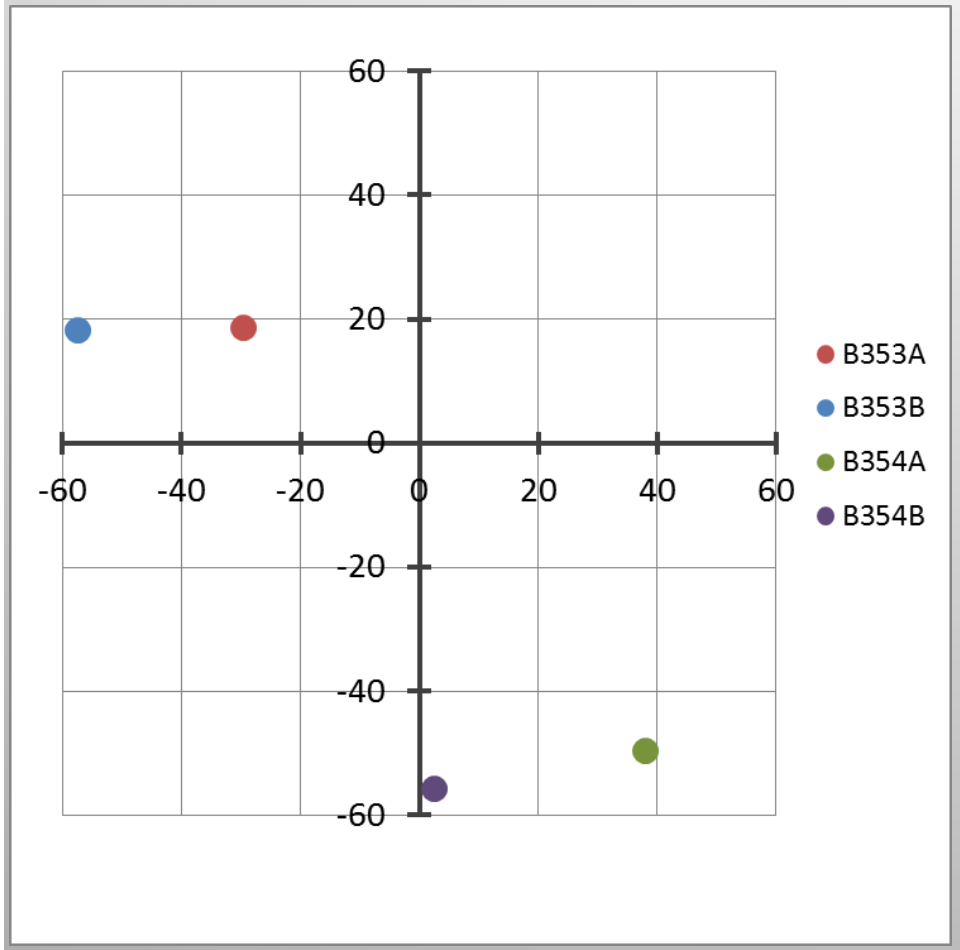
[1] Projected energies with current optics pending commissioning and damage testing
[2] Based on two 90-015 target pointing shots (90-239 positioner not qualified)
[3] Without affecting 35B (i.e. drop Q35B)
[4] Without requiring platform development to extend current capability

Estimated energy vs pulse width for current optic ROE (1 kJ @ 30 ps)



Pointing data for two shots on 90-015 target positioner produced an alignment accuracy of (X_{ARC},Y_{ARC}) = (42,31) μm rms

N150830-002-999



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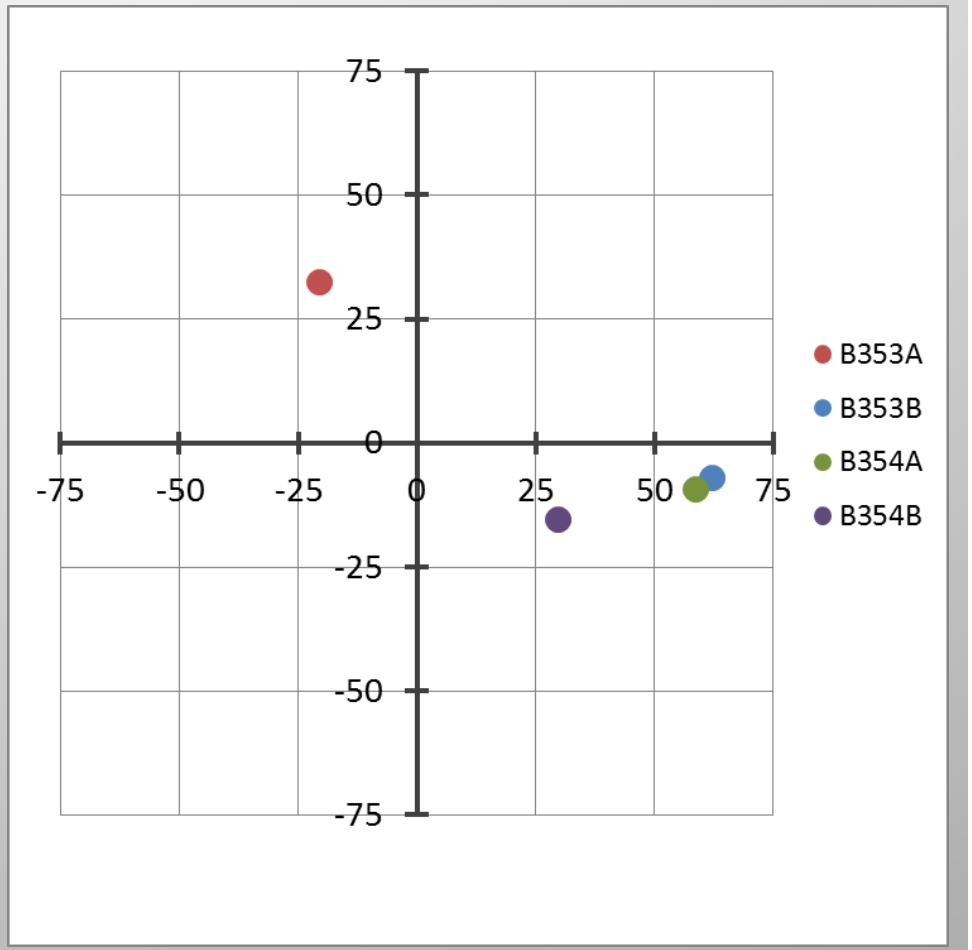
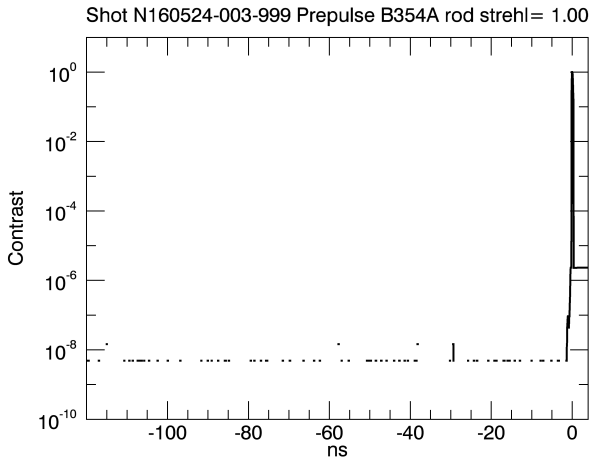
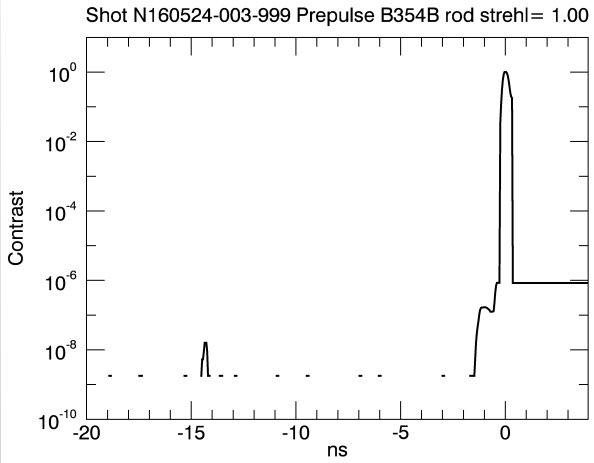
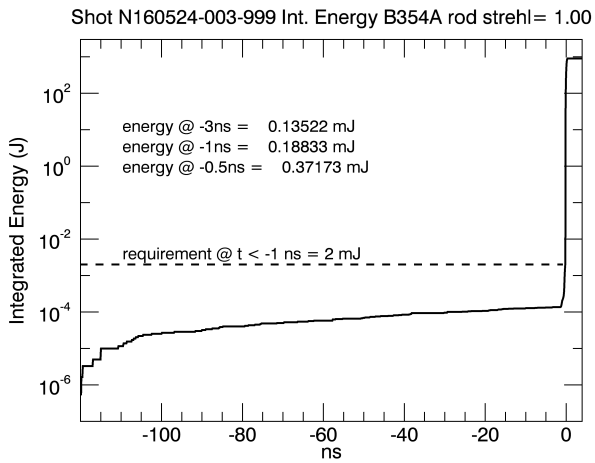
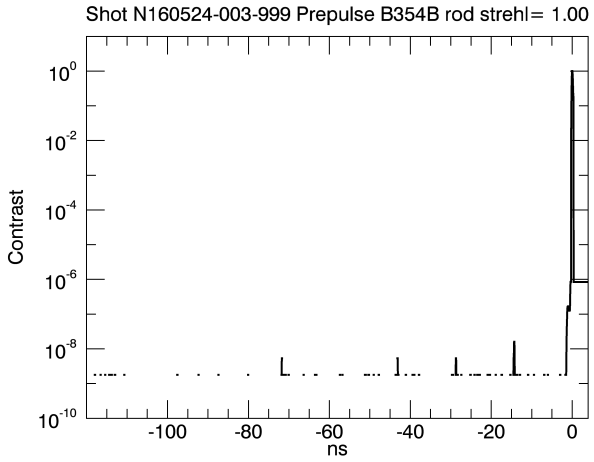


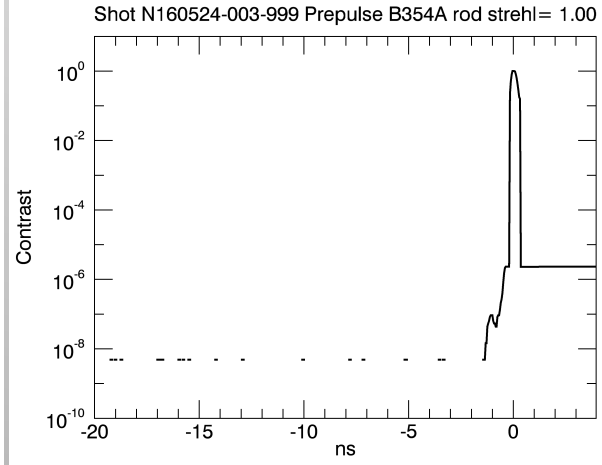
Pre pulse data for N160524 produced 80 dB contrast for t < - 1ns & 60-70 dB @ -1 ns

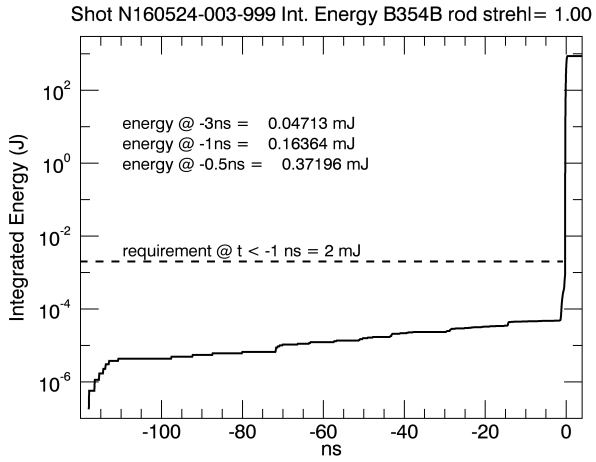




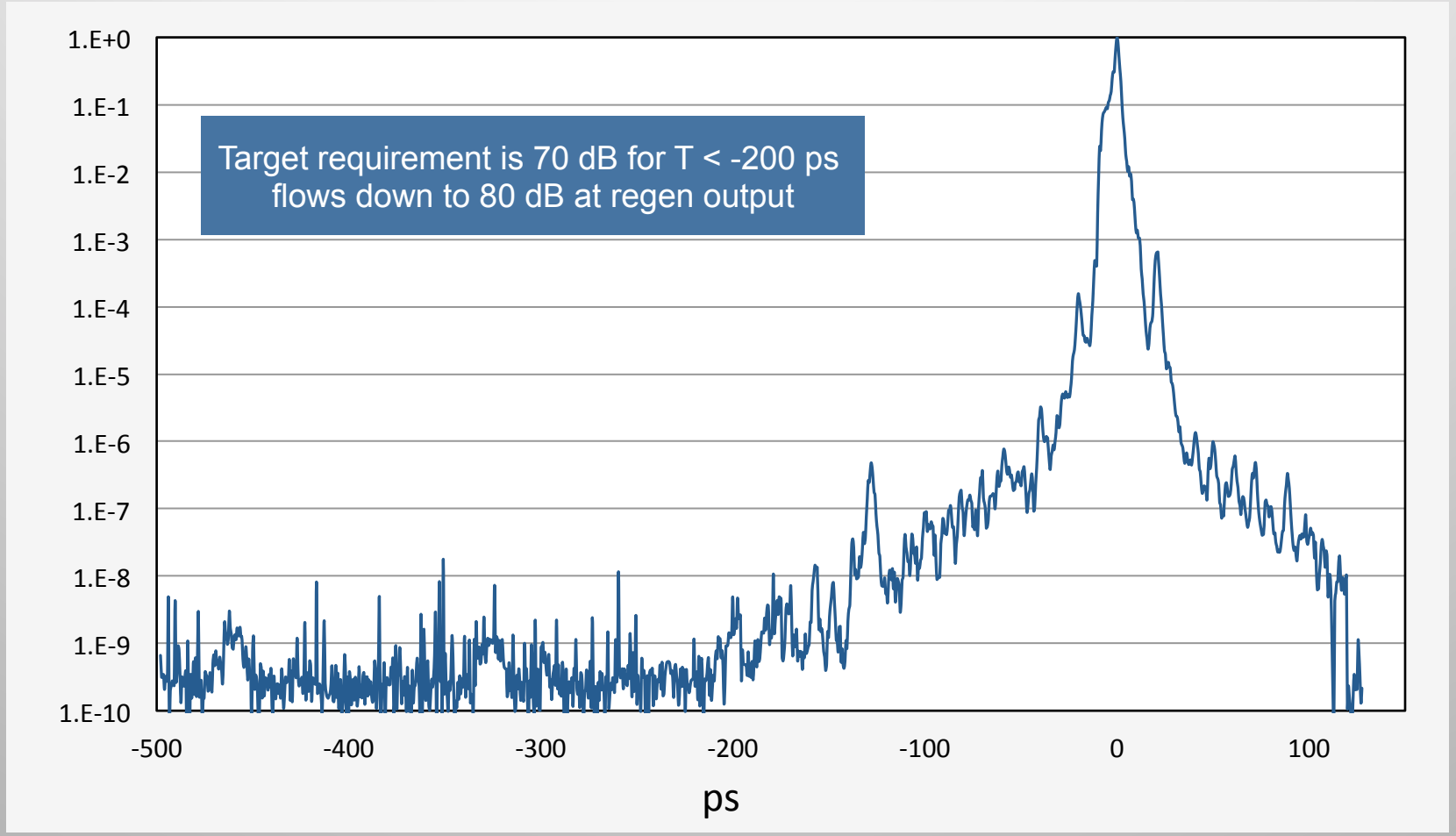




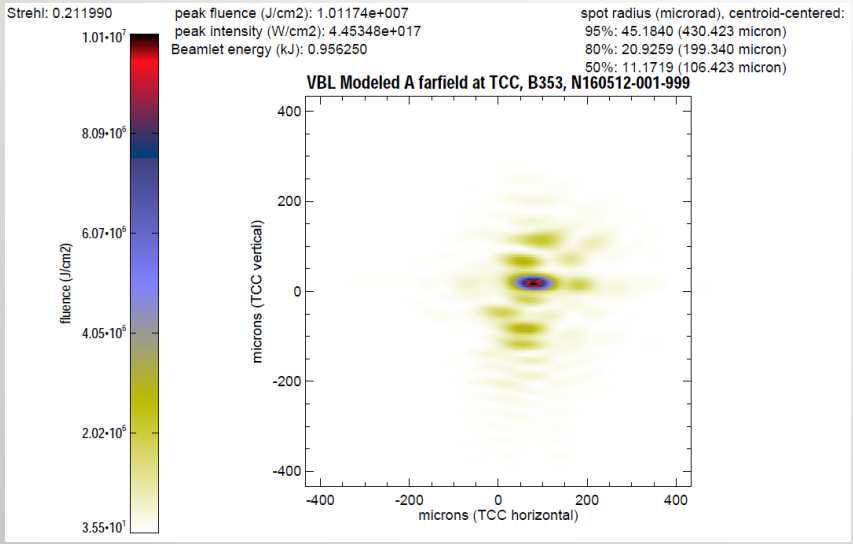


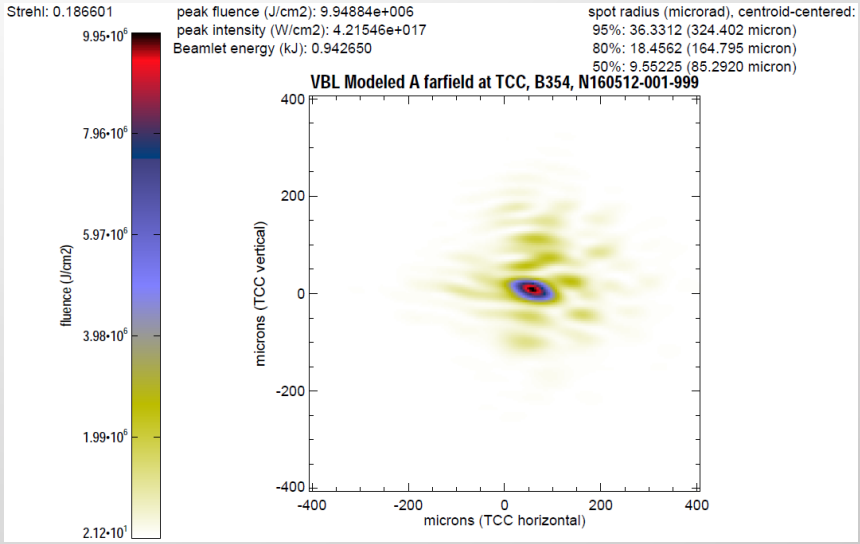


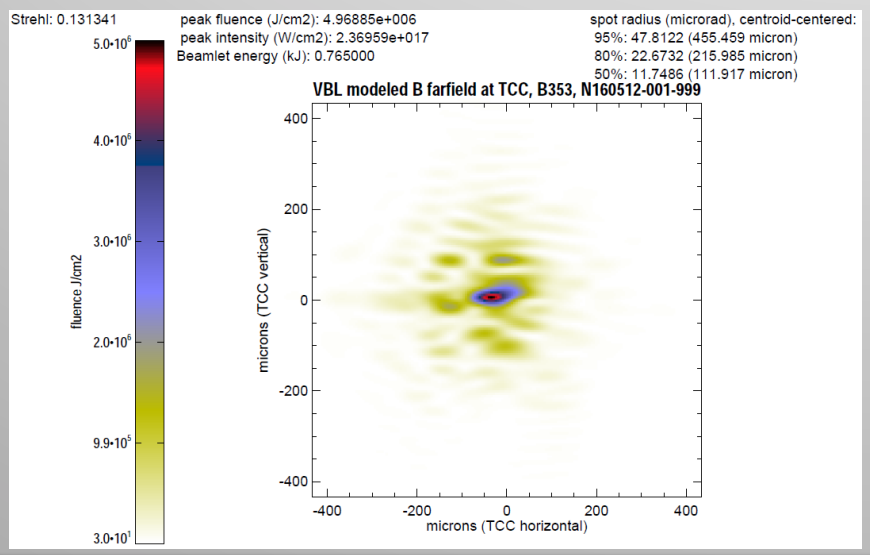
High Contrast Front End output meets prepulse contrast requirement of 80 dB for t < -200 ps

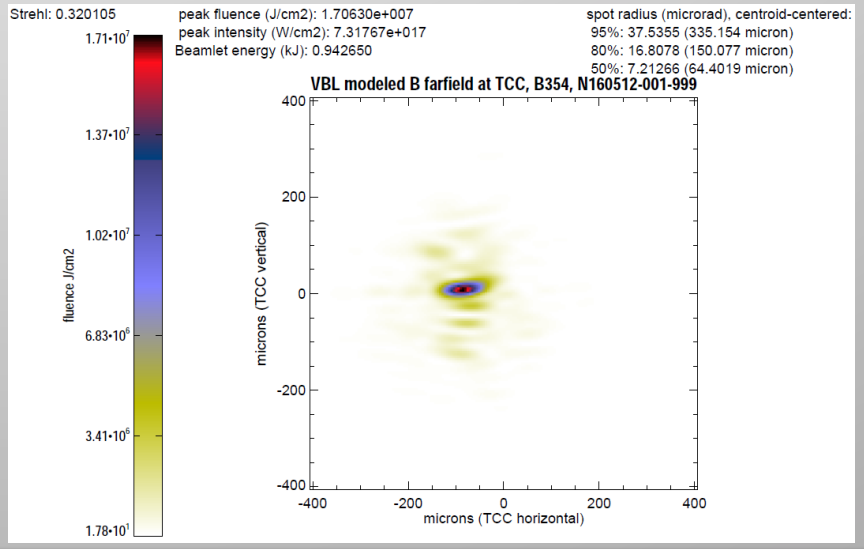


Calculated ARC beamlet far fields using VBL & measured wavefront data for N160512-001-999



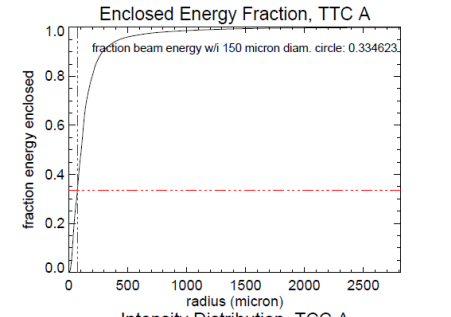


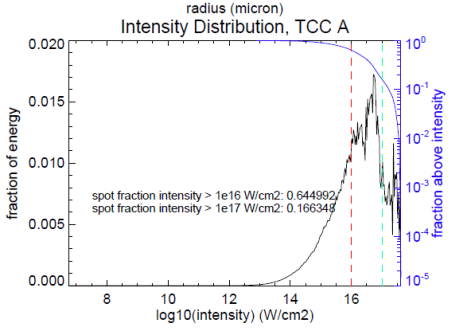


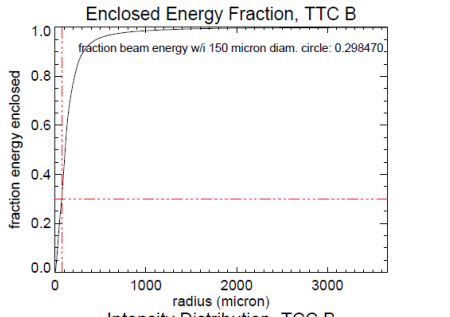


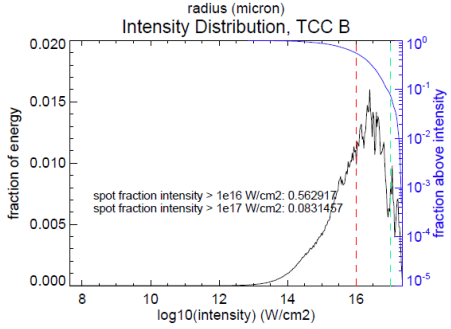
VBL FF calculations estimate 30-50% of the energy in 150 µm diameter & 10-30% energy > 10^{17} W/cm^2

B353









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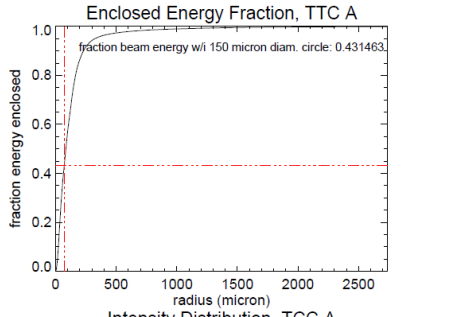

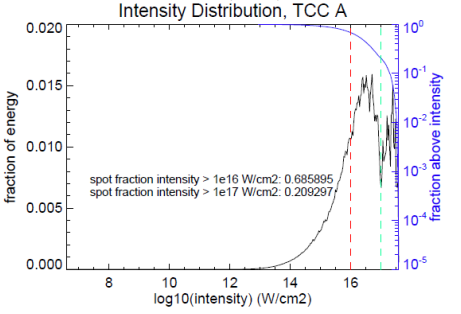

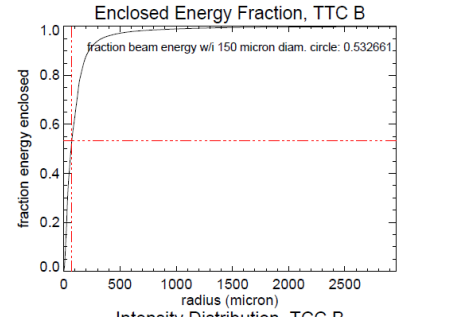

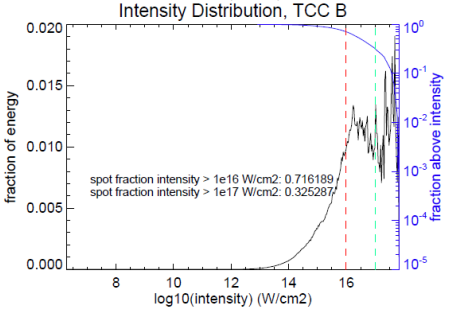

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